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UTERINE, TUBAL AND OVARIAN LYSIS AND RESORPTION OF CONCEPTUSES.¹

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It has long been known that considerable intrauterine retrogression of a conceptus can occur in multiparous mammals. D'Outrepoint, for example, on page of the 192 catalog of his collection, is said to represent the uterus of a rabbit, in which an apparently full term fetus is found near the distal end of one horn, although the approximate portions of both horns contained nothing but remnants of fetuses—one in each. According to Muller, '47, the enlargement in the right horn contained a "cyst filled with rabbit hair imbedded in a soft mass and that on the left side a similar convolute of hairs without a cyst." This, as far as I know, is the earliest reference to, even if not the earliest observation upon a fetal retrogression. But since rabbits are born naked, one is left to speculate upon the validity of this observation. However, that the idea holds is indicated also by some experimental work. Sokoloff's, '96, meager report, for example, seems to indicate that in dogs bilateral ovariectomy leads to the death of the embryo and to abortion of it and of the entire conceptus. Strahl and Henneberg, '02, also found that conceptuses in different stages of retrogression occur quite commonly among normally developed ones in the ferret, marmot and mole. They also found that the entire placenta and probably also the fetal membranes, as stated by Hubrecht, normally are retained for some time, even up to a month after parturition in the mole. Similarly, Frankel, '03, was able to cause the death and also the uterine absorption of conceptuses in rabbits up to the 20th day of pregnancy, through destruction of the corpora lutea. Frankel found that after 14 days, all that remained in the way of evidence of some pregnancies was an anemic ring which disappeared completely within three weeks. Henneberg,

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'03, also found that intrauterine death and retrogression of the guinea pig fetus can be effected experimentally through various means, and according to Koebner, '10, not merely ova or young fetuses are absorbed, but even the bones of older ones disappear completely under experimental conditions in the rabbit. It would seem unlikely, however, that such could be the case in any but the very earliest stages in the development of the skeleton for a considerable degree of acidity would have to develop in order to make this possible. Since it is believed that the development of acidity not only is slow but also slight in embryonic tissues, Koebner's conclusion regarding the bones seems to be open to some doubt. Wiener, '05, also found that autolysis is very slight in tissues with an alkaline reaction and that a slight increase in acidity greatly accelerates it.

Fraenkel, '10, extended and confirmed his work done in '03 by a very large series of experiments touching various phases of the corpus luteum problem and among other things concluded that one corpus luteum can protect at least three ova sufficiently to insure continued development.

Although the ova found by Huber, '15, were very young, the significance of the facts would seem to be similar. Likewise Mall, '15, while writing "On the fate of the human embryo in tubal pregnancy," stated that "we have no data on the number of ova which disintegrate early, but the study of comparative embryology warrants the conclusion that many young ova degenerate and disintegrate. I am informed by Dr. Huber, who has studied with great care much material among rats, that some of the fertilized ova break down before implantation. The same seems to be true regarding the pig. We usually find more corpora lutea in the ovaries than embryos in the uterus, indicating that all of the ova do not produce normal embryos." Similar phenomena also were reported by Meyer, '17, in regard to young conceptuses in the guinea pig. Curtis, '15, also reported the absorption of ova in guinea pigs in consequence of the injection of extracts of the human placenta, but unfortunately did not give convincing evidence regarding his knowledge of the presence of pregnancy in the animals concerned, and did not make a microscopic examination. Since Curtis stated that

injections of defibrinated human blood had the same effect as the injection of extracts of the human placenta, and that the injection of extracts of guinea pig placenta and of guinea pig blood had no effect whatever, one can not help but feel decidedly skeptical regarding the trustworthiness of his experimental proof.

It is well to remember in this connection that phenomena which occur in other mammals, or conclusions drawn from these phenomena, must be used with caution when referred to man. The uteri of other mammals well may show a greater tolerance to the presence of dead fetal tissue and also greater resorptive power. Robinson, '04, stated that Vernhout showed that maternal tissues are not shed at the time of birth in the mole, and that some of the fetal tissues are retained to be absorbed later. Hill, it seems, found the same thing to be true in *Perameles* and *Dasyurus*. Jenkinson, '13, also stated, that in *Perameles*, the allantois and its blood vessels regularly are absorbed through the agency of maternal leucocytes by the parturient uterus and that fetal tissues are absorbed somewhat similarly in *Dasyurus*. However, since the young of some marsupials are in a very immature state during the first months of gestation and are then transferred to the marsupium as naked little fetuses said to be only about one inch long in the kangaroo, it is clear that absorption of the secundines at this stage of development would be something quite different from their resorption at the end of the gestation period in other mammals.

Although we have considerable evidence regarding retrogression and the partial or even the total intrauterine absorption of conceptuses in various mammals, I have not been able to find any conclusive evidence in the literature regarding the occurrence of this phenomenon in man. It is true that cases of Frankel, '03, Polano, '04, Rosenkranz, '03, and also cases reported by others are referred to as such examples, but a careful examination of the reports shows that those cases hardly can be regarded as falling under the head of intrauterine absorption of ovum, embryo or fetus. It is true that in the cases of Polano and Rosenkranz, the skeletal elements only were seen to have been discharged, but in the case of Polano the amniotic fluid never-

theless may have carried a great many fragments of embryonic tissue away with it beforehand. Furthermore, Polano does not claim his case as one of complete intrauterine absorption but merely as one of remarkable intrauterine maceration under aseptic conditions.

The history of the case of Rosenkranz, on the other hand, shows quite clearly that the fetus was destroyed by putrefactive changes. Rosenkranz himself emphasized this, but strangely enough ruled out entirely the occurrence of maceration. Rosenkranz further stated that the patient herself noticed the discharge of some bones with the "menstrual" flow. However, under the above conditions the recurrence of true menstruation is exceedingly unlikely unless the fetus was dead a considerable period before the rupture of the membranes occurred, and the placenta had been detached at least partly, for only under such circumstances could considerable regeneration of the mucosa occur and thus make the return to normal menstruation possible. It nevertheless is possible, however, that the time of abortion was co-incident with the date on which menstruation might have recurred. A small number of cases in the Mall Collection give a history which makes such a suggestion probable. Just why the expulsion of a dead, retained conceptus should occur at the time when menstruation would have recurred normally had pregnancy not supervened, is difficult to say, but since the inhibitory effect upon the menstrual cycle exercised directly or indirectly, by the living fetus is absent in cases of premature death and retention, it is possible that the abortion might occur at a time when the impulses of a return to the normal nonpregnant status of the maternal organism becomes more evident; that is, at the time of the recurrence of the normal menstrual cycle.

One can not but recall in this connection another group of cases which give a history of uninterrupted menstruation throughout the entire period of pregnancy. In some of these cases it is evident that it is a question of more or less regular hemorrhage rather than of true menstruation, and it may be possible that in the others these hemorrhages happened to fall at intervals of the same length as the normal inter-menstrual periods. In the

last group of cases the exact status can not be discerned from the histories alone. However, since there is no endometrium or at most a partial one, to shed, genuine menstruation manifestly can not occur throughout pregnancy. It seems more probable that the cases of supposed uninterrupted menstruation fall into the last group although it is not impossible that rarely hemorrhage may occur only at the dates of normal recurrence. This would seem possible because of the defective inhibition of the returning normal impulses exercised by the dead or dying conceptus and the retrogressing corpus luteum. This conclusion harmonizes with the tendency to abortion which seems to be present at the time of periodic hyperemia and hyper-irritability in some of these cases.

Although dissolution of the embryo or fetus alone has long been known to occur, there seems to be no convincing evidence in the literature for the occurrence of intrauterine autolysis and absorption of entire conceptuses. Moreover, as already stated, it is to be doubted very seriously whether complete intrauterine absorption is possible after the formation of the skeleton has been well begun. The fetal parts at this time are so resistant that the uterus is stimulated to expel the macerated remnants long before absorption of them can occur. Furthermore, complete absorption would also seem to be hindered by the physical conditions which obtain in the human female. Only as long as the decidua capsularis is relatively thick, and hence effectively prevents the escape of the products of autolyzed embryonic tissue, would complete absorption of a young uterine conceptus seem to be possible. The same thing probably is true in some cases of tubal pregnancy although the occurrence of early and repeated, yes, even prolonged, hemorrhage in them makes complete intra-tubal absorption much less likely. However, that complete intrauterine absorption actually does occur in the human female, it is the object of this article to establish.

The occurrence of missed abortion and also of missed labor long have been matters of common knowledge among physicians. But these are phenomena usually connected with the later months of pregnancy. In the overwhelming majority of these cases the fetus was retained for a considerable period after its

death and then aborted in a more or less macerated condition. Under these circumstances it may, to be sure, undergo absorption in part, but expulsion of macerated or even calcified remnants of the fetus nevertheless eventually occurs. That this is so even after an exceedingly long period of retention in utero, is shown splendidly by the case of Schaeffer, '98.

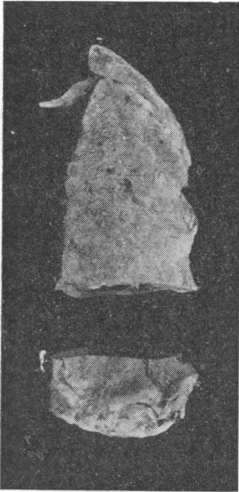


FIG. 1. External appearance of No. 698. The excised portion was used for microscopic examination. $\times 1$.

Among the large series of over 2,000 abortuses in the Mall Collection, I have so far found only a few specimens of almost complete intrauterine absorption. In one of these, number 698, only a few vestiges of syncytium and trophoblast remain. Not a single fragment of the chorionic or amnionic vesicle or of the embryo could be found upon microscopic examination. Were it not for the presence of decidua and the above microscopic embryonic remnants, one might doubt whether pregnancy really had supervened in this case. However, since the specimen shown in cross section in Fig. 1 was aborted with the entire intact decidua which still surrounded the remnants of the conceptus completely as shown

in Fig. 2 there manifestly could have been no loss of embryonic tissue either before or during abortion. This abortus, which measured $50 \times 20 \times 13$ mm. was donated by Dr. N. E. B. Iglehart, of Baltimore. It had a menstrual age of 56 days, but the condition of the few remnants and the size of the implantation cavity show that development did not proceed very far before growth was inhibited. Aside from the absorption of almost the entire conceptus, the decidua not only is infiltrated, but also shows degenerative changes. As illustrated by Fig. 2, which shows the intact capsularis separated by a narrow space from the vera, the former is filled completely by blood clot. It is at the periphery of this clot that the isolated microscopic remnants of the syncytium and trophoblast, together with a few gossamer or shadow villi are found. Since

there is no blood between the capsularis and the vera it would seem to follow that the hemorrhage was limited entirely by the capsularis, a conclusion which is indicated also by the absence of a history of bleeding. Since the last menstruation began on April 11 and the abortion occurred on June 6, it is seen that the

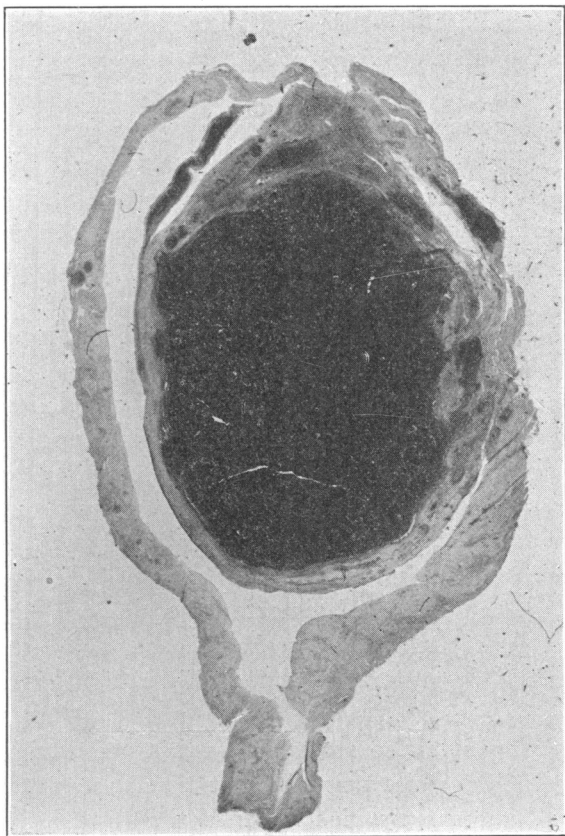


FIG. 2. Cross section of the above showing the disposition of the decidua and the contained blood clot. $\times 5$.

latter occurred on the first day of the beginning of the second lapsed menstrual period. Although the appearance and the condition of the decidua seems to suggest that considerable regeneration of the endometrium had occurred, it is possible though unlikely, that the bleeding accompanying the abortion was

menstrual and that hence the abortion should be regarded as a mere incident accompanying the return of normal menstruation rather than as the predominating event.

That considerable restoration of the endometrium may occur while the conceptus still is within the uterus was shown by the case of Orloff, '95. In this case the endometrium was composed of a cylindrical epithelium and the uterine musculature showed no evidences of the presence of gestation changes. Ivanoff, '98, also found the decidua absent in a case of long retention and its place taken by a low cylindrical epithelium although the placenta still was partly attached to the uterus. Frankel, '03, also emphasized the fact that regeneration of the endometrium may begin before abortion occurs and these things make it possible that hemorrhage which may occur at time of abortion may largely be true menstrual hemorrhage.

The absence of blood between the capsularis and the villi and the absence of a history of bleeding do not, to be sure, imply that the development of this conceptus progressed uninterruptedly until birth. The histologic picture alone is conclusive proof to the contrary. In the absence of any larger portion of the conceptus it is impossible to say about how far development had proceeded, but it is unlikely that it proceeded much beyond the first month. In any case, disintegration, solution and resorption of almost the entire conceptus surely must have consumed several weeks at least. Indeed, it is possible that the ovum never became firmly attached, though imbedded in the decidua.

In other cases it also seems likely that the fertilized ovum became imbedded quite normally but that it was strangulated by severe hemorrhage which loosened the attaching villi, thus interrupting the intervillous circulation. Since the resulting stagnation of the blood must make the indispensable chemical interchanges upon which the life of the embryo depends, impossible, the latter probably dies first. It is decidedly interesting that considerable hemorrhage, sufficient, in fact, to result in the death of both the embryo and the chorionic vesicle, can occur while the whole conceptus still is surrounded by the decidua capsularis, without rupture of the latter. The failure of absolute

or complete absorption of the last few small remnants of this conceptus probably may be attributed to the fact that the small remnants of degenerate trophoblast and syncytium which remain, or the influence of the corpus luteum no longer were able to inhibit menstruation. Hence the decidua, together with these few small remnants of the conceptus were expelled *in toto* and it may be extremely significant that this occurred exactly two menstrual months after the beginning of the last period. Since three other specimens of a series of seventeen composed of villi only were aborted at the time of recurrence of the regular period, the idea that abortion occurs oftener at this than at any other time would seem to receive some confirmation. Moreover, it would seem quite natural that a detached decidua which has subserved its functions would be more likely to be shed at this time and that an unabsorbed conceptus which had been converted essentially into a foreign body, should then also be expelled. Since detachment of the decidua also permits regeneration of the mucosa and isolates the conceptus, it removes the inhibitory effects of the conceptus upon the maternal organism and clears the way for a return to the normal non-pregnant status.

It, to be sure, is impossible to decide how far the development of this conceptus had progressed before its death, but the marked extent of the absorption shows beyond doubt that the latter would have been completed long before the advent of the next or third menstrual period had the second period also been inhibited. Under these circumstances the empty decidual cast then would have been expelled alone and well might have directed attention to the possibility of the existence of a tubal rather than a uterine pregnancy.

A second case is number 970, donated by Dr. R. W. Hammack, of Manila. This specimen is interesting not only because it also is a case of marked intrauterine absorption, but because it was obtained with the entire uterus, at necropsy. The chorionic vesicle, which measured only 3 x 5 mm. together with the entire thickness of the decidua and the musculature, is shown in cross section in Fig. 3. The uterine cavity contained some blood and the entire decidua was covered with hemorrhagic nodules the

largest of which were about 10 mm. in diameter. One of these which was a trifle larger than the rest contained the conceptus. The cavity of the chorionic vesicle was filled with a homogeneous substance containing degenerate cells and portions of disintegrated chorionic membrane. The villi are only about .5 mm. in length and are covered with trophoblast and syncytial buds.

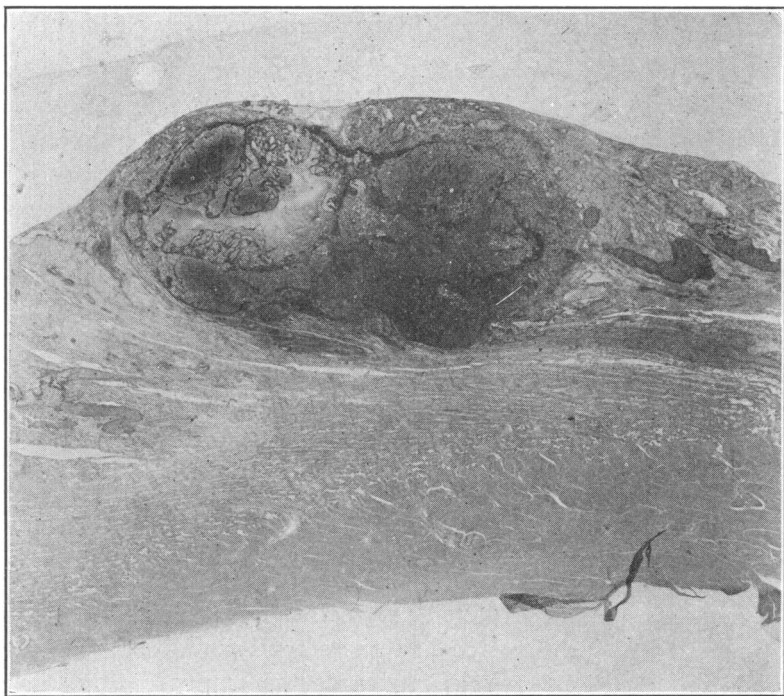


FIG. 3. Sections through the decidua and conceptus No. 970, showing a slightly bulging but intact capsularis.

No trace of the embryo or of the amnion was found, although the whole conceptus is covered still by the capsularis, which, like the rest of the decidua, is infiltrated. Although lysis and absorption did not progress so far in this as in the previous specimen, the process nevertheless is far advanced. It proceeded no further probably because the mother committed suicide, although the multiple hemorrhages in the decidua would seem to suggest that abortion nevertheless was seriously threatened,

if not inevitable, before she took her life. That the focal hemorrhages in the decidua could be attributed to the hydrochloric acid swallowed with suicidal intent, is extremely doubtful, for the histologic condition of the conceptus shows conclusively that the changes in it could not possibly have been produced in the short interval of four days which elapsed between the suicidal attempt and death. Since the menstrual history of the case remains unknown it is impossible to determine the menstrual age of the specimen but the degenerate chorionic vesicle would seem to imply an age of only about ten or twelve days. However as this young woman was but sixteen years and apparently illegitimately pregnant, it is more than likely that the suicidal attempt occurred, as so often is the case, during the time of the first lapsed period. Hence the surmise that the multiple hemorrhages in the decidua may have been provoked by the returning menstrual cycle, gains somewhat in probability. Especially so since the size and the condition of the conceptus both suggested that it must have died some weeks previous to its abortion.

A third early specimen illustrating the progress of intra-uterine absorption is number 962, donated by Dr. Joseph M. Jackson, of Pittsburgh. In contrast to the preceding two, this chorionic vesicle contained a macerated embryo 4 mm. long. The menstrual age is unknown but the chorionic vesicle measured 34 x 28 x 24 mm. and was covered almost entirely by villi. The latter which contained degenerating vessels, are matted together with necrotic trophoblast and show other evidences of retention. As shown in Fig. 4, which represents a cross section of the entire conceptus with the surrounding decidua, the amnion was preserved and contained some coagulum. Mall found the embryo greatly macerated and the organs and cavities partially obliterated. The slight break in the decidua capsularis may be the result of handling or of technical procedures. Since the specimen was aborted with the entire decidua there can be no question of escape of a portion of the conceptus.

That it not alone is very young conceptuses which may undergo almost complete lysis, is illustrated by number 606, a chorionic vesicle measuring 18 x 13 x 18 mm. This specimen, which was donated by Dr. Charles S. Parker, of Baltimore, is covered with

villi 2.35 mm. long. Yet Mall found no trace of an embryo and stated that the villi and the chorionic membrane are structureless in spite of the outwardly normal appearance of the chorionic vesicle. In the absence of the clinical history one must needs be cautious but I think it safely can be assumed that in this case neither embryo nor amnion disappeared solely as a result of postpartum maceration. That this assumption probably is

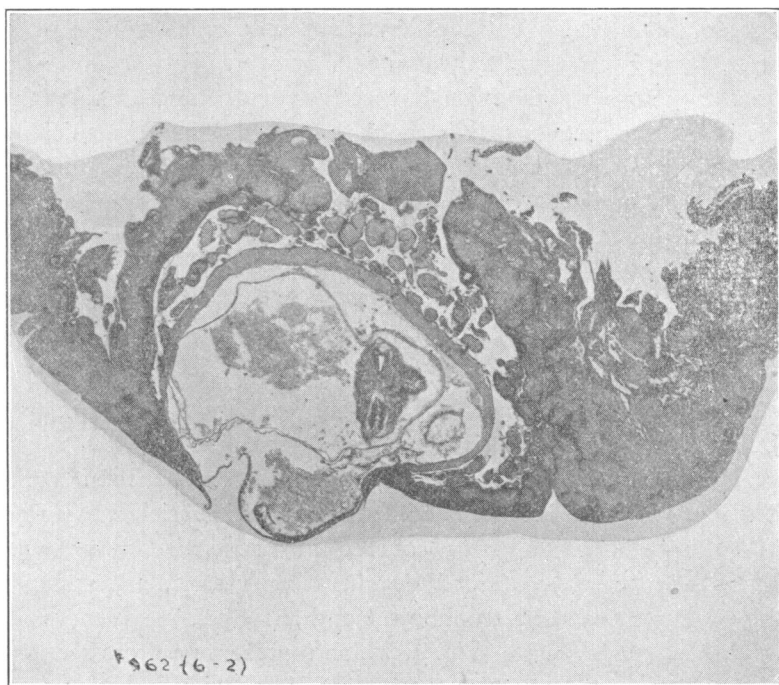


FIG. 4. Section through the decidua and the contained conceptus No. 962.
The capsularis is slightly broken.

correct is shown also by other specimens, the histories of which fortunately are known. Nevertheless, maceration, although not necessarily putrefactive maceration, undoubtedly was an important factor in the production of the state in which this specimen is found. This conclusion is confirmed by the occurrence of all manner of transitions between the almost perfectly preserved structure and the pure shadow or gossamer pictures

such as presented in the photograph of the cross sections of the villi of this specimen shown in Fig. 5. All that remains of the villi is a spiderlike web, the fibres of which are exceedingly fine but which nevertheless preserves the form of the villi and of the chorionic membrane so perfectly that Mall especially recorded that the external appearance of the chorionic vesicle was normal.

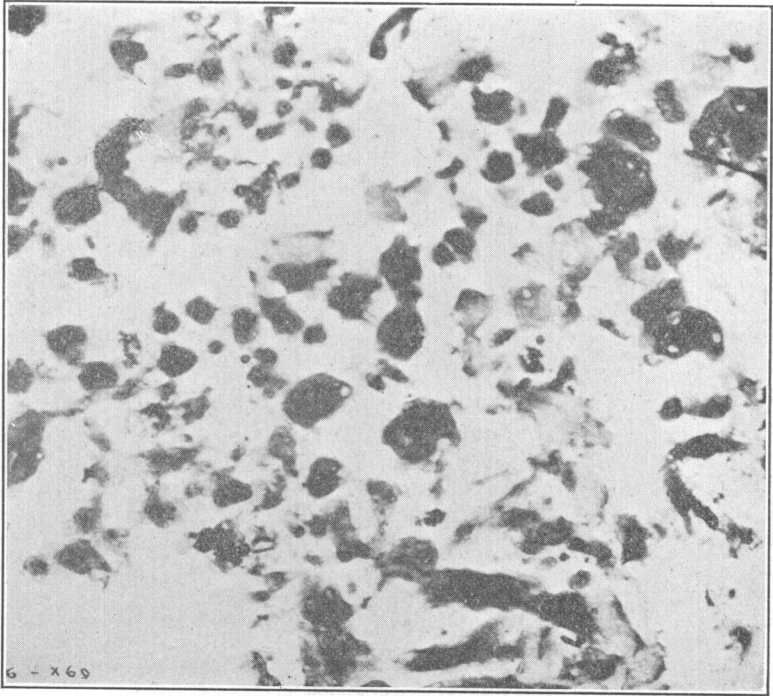


FIG. 5. Cross-sections of the gossamer villi of No. 606. $\times 69$.

Since chorionic vesicles devoid of an embryo when examined form about 32 per cent. of those classed as pathologic in the Mall Collection it is evident that absence of the embryo itself is relatively common in early abortuses. It would be incorrect, however, to assume that they had undergone absorption in all these cases. A fine example of one of these empty chorionic vesicles is number 1224, a portion of which is shown in Fig. 6. This specimen was found in an unopened uterus removed at hysterectomy for cervical myoma. The chorionic vesicle,

which measured 36 x 25 x 13 mm. was collapsed, free from the uterus, and imbedded in coagulum. The only content of this chorionic vesicle was a dark grayish coagulum which contained no remnant of the embryo or of the amnion. This almost amorphous so-called magma included only a few isolated cells. In

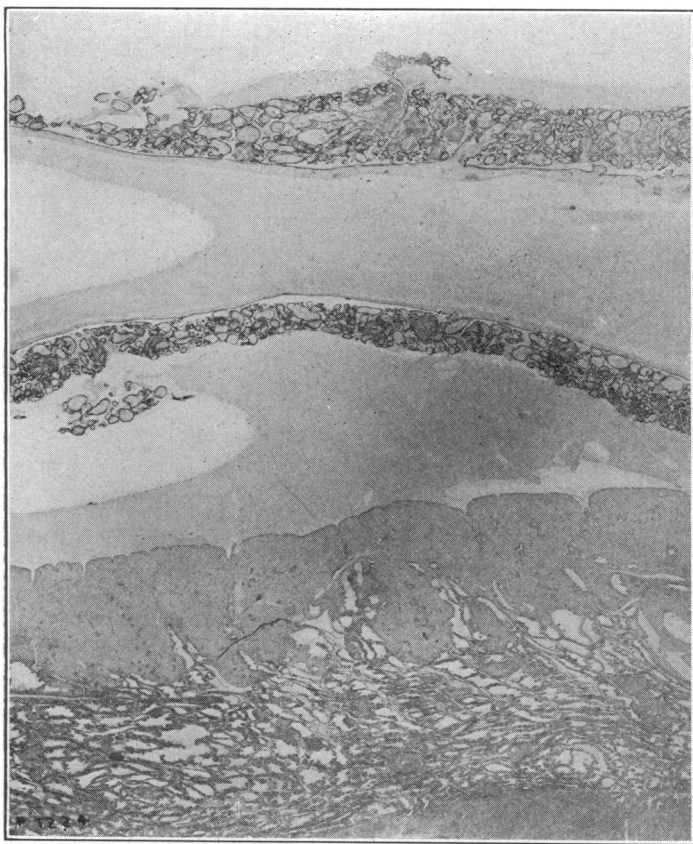


FIG. 6. Section through the isolated empty conceptus and the adjacent decidua of No. 1224.

spite of this fact the trophoblast, which had markedly proliferated, was well preserved over large areas, and many of the vessels in the chorionic membrane were filled completely with erythroblasts. A few degenerate masses of trophoblasts and fused degenerate villi also are present. Some villi show evidences of

maceration, others of "mucoid" degeneration although they still may contain vessels. Some, however, are represented by a hyaline outline only. The stroma and the epithelium of many of the villi are well preserved, however, and the same thing holds for the chorionic membrane. The decidua shows slight general and very marked local infiltration. Some remarkably dense periglandular and perivascular zones of infiltration also are

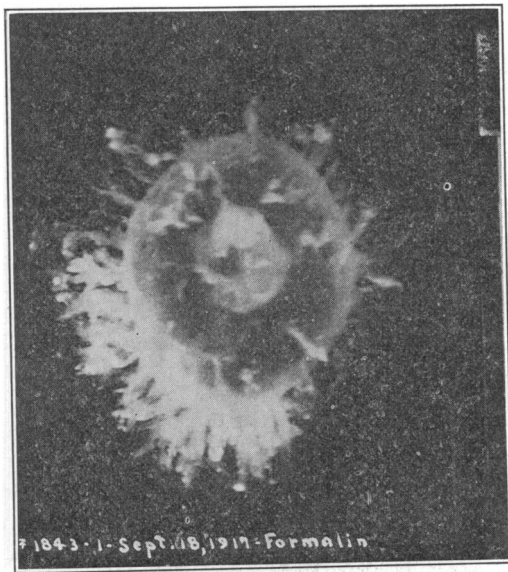


FIG. 7. External appearance of No. 1843. $\times 6$.

present. The mucosa, too, is infiltrated and contains islands composed exclusively of round cells. Besides maceration effects, many of the villi show marked changes, undoubtedly hydatiform in character. In this case it is possible that we are dealing not so much with absorption as with dissolution of the embryo, for the digestion products of embryo, yolk sac and amnion, instead of having been wholly absorbed still may be contained in the fluid within the chorionic vesicle.

Before briefly considering the evidence regarding absorption offered by tubal and ovarian specimens, I wish to refer to number 1843. This specimen, which was donated to Stanford Uni-

versity by Dr. Eugene V. Falk, of Modesto, California, had the villi rather sparsely and irregularly distributed as Fig. 7 shows. However, the entire specimen was so splendidly preserved that investigators of unique opportunity and experience were uncertain as to its normality. Even after careful inspection under low magnification the writer, too, felt uncertain, but on receipt of the specimen he had informed Dr. Falk that it probably was pathologic. This opinion was based almost wholly on the irregular distribution of villi, their complete absence on part of the surface; on the large size of the yolk sac; the unusual translucence of the entire specimen; and upon the *apparent* absence of the embryonic disc. About one-third of the entire surface of the chorionic vesicle was devoid of villi and where they were present they seemed to be in widely different stages of development. They differ markedly not only in length and in diameter but also in the complexity of their branching. Some which were represented by fine threads merely were found to be represented by stroma only, the epithelium having been stripped, probably during the removal of the blood in which the specimen was imbedded before it was received at the laboratory. Other villi are torn, those which are preserved are clubbed but slightly and some are so short that they look like little droplets on the surface of the chorionic membrane. Those near the bare areas are almost transparent but nearer the other pole they become more opaque. The caliber varies from $1/6$ to 1 mm. and the greatest length is 2.25 mm. The chorionic vesicle measured 6 x 4 x 5 mm. and the partially invaginated yolk sac, 2 x 2.6 x 1.8 mm. A smaller, less transparent vesicle, which was thought to represent the amnion, was seen between the yolk sac and the chorionic membrane, but no embryonic disc could be recognized. An examination of the microscopic sections of this vesicle showed that it was macerated. The epithelium is missing in many places and the histologic details are wanting. Hence this chorionic vesicle very evidently ceased to live some time before it was aborted, and this conclusion is corroborated also by the clinical history. The menstrual age of the specimen is 39 days but the chorionic vesicle, which was approximately spherical, measured only 6.5 mm. instead of 25 mm. to 30 mm. as implied

by the menstrual history. That growth ceased long before the occurrence of the abortion is implied also by the fact that Dr. Falk stated that the patient had a slight uterine hemorrhage about 10 or 12 days before the abortion. It is interesting, and probably also significant that the date of this hemorrhage also coincides with the time when the first lapsed period was due. This is possible because this conceptus apparently had been dead sufficiently long to fail to inhibit the return of menstrual bleeding. Since the size of the chorionic vesicle suggests an age of 10 to 12 days, this assumption seems warranted, especially since it may be assumed that development probably never proceeds undisturbed to the time of abortion, whenever the pregnancy is terminated spontaneously or perhaps better, without the intervention of external or of internal mechanical forces or factors. It may be largely because of this fact that conceptuses from abortions resulting from intrauterine causes always are macerated.

Careful examination of the serial sections generously made in the Carnegie Laboratory of Embryology, fails to reveal any remnant of the body of the embryo except perhaps a small nodule shown above (2) in Fig. 8. Yet according to the menstrual age the embryo should be 10-12 mm. long. The appearance of this nodule suggests that it may be a remnant of the primitive streak in spite of its deep location, although it may also be a rudiment of the allantois. The yolk sac is large and invaginated and its size out of all proportion to that of the embryonic Anlage. Between the latter and the chorion there is a rather large mass of cells containing a space which I take it, represents the amniotic cavity. An examination of this cavity and of the surrounding cells suggests that it resulted from splitting as is the case in bats and as is assumed for man. The cavity, to be sure, may have resulted from dissolution of the cells *in situ* and if in fact it represents the early amniotic cavity, then it is certain that whatever its genesis, it was not formed in consequence of folding. It would seem then that we have here a conceptus in which the process of development of the embryo itself was inhibited very early and that the yolk sac and the chorion continued to grow for some time.

Aside from showing a probable and hitherto unobserved stage

in the formation of the amniotic cavity, this pathologic chorionic vesicle is of special interest also in the absence of coagulum or so-called magma. The chorionic vesicle and the space taken for the amniotic cavity were filled with perfectly clear fluid. Although this small conceptus is markedly macerated it is



FIG. 8. Section through the chorion, amnion (?) and yolk sac of No. 1843 at the point of attachment. The small nodule of cells above (2) may be a remnant of the primitive streak or of the allantoic stalk. $\times 69$.

only in the early stages of disintegration. Nevertheless, much longer retention might have resulted in its complete dissolution even if not its complete absorption. Since this small vesicle was aborted in its entirety with blood clot, it is highly probable that most of these degenerative changes occurred after it was loosened from the implantation site, probably by rupture of the decidua capsularis in consequence of hemorrhage.

In other older conceptuses in earlier stages of disintegration,

as number 2047, the amnion is preserved and distended as shown in Fig. 9. Both chorion and amnion are macerated and distended with clear fluid and it seems strange indeed that the embryo and the yolk sac may disappear completely without even a final clouding of the amniotic fluid. There may have been temporary clouding, but every now and then a specimen is received in which both the vesicles are distended with absolutely clear

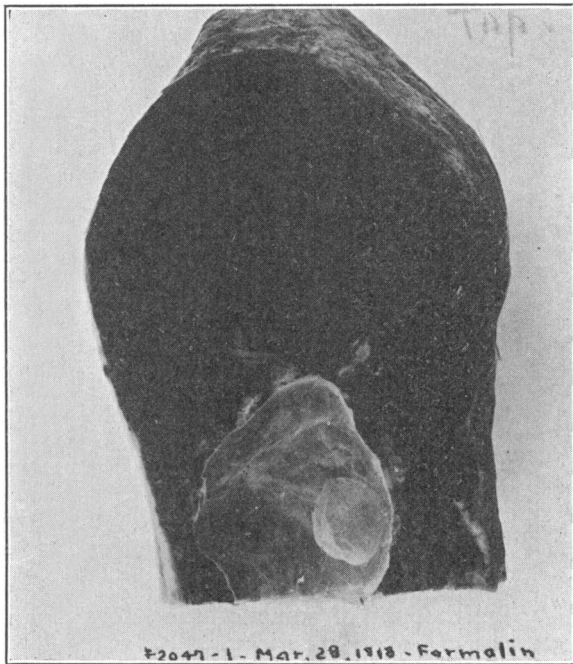


FIG. 9. Gross appearance of abortus No. 2047 showing a large blood clot containing a transparent chorionic and an empty amniotic vesicle. X 3.

fluid, a fact which also implies that autolysis of the embryo occurred without digestion of the enveloping amnion.

Since only a pseudo-decidua forms, and then but rarely and very early, in cases of tubal pregnancy, the sequence of events leading to dissolution of the conceptus must be rather different. There can be no accumulation of blood in a capsularis. Hence the conceptus usually becomes isolated in blood or blood clot within the tube, and undergoes degeneration as the hemorrhage

continues and the tube becomes distended. If detachment of the conceptus occurs very early, it is conceivable that it may undergo complete disintegration also within the tube, that the latter may heal and the symptoms subside completely. While the occurrences of such instances of spontaneous cure of tubal pregnancy undoubtedly are exceedingly rare, evidence at hand seems to show that they can not be wholly excluded. This, I am told, agrees also with contemporary clinical opinion.

The possibility of tubal abortion with subsequent intraperitoneal disintegration, lysis and absorption must, to be sure, also be borne in mind. The occurrence of nothing but fragments of villi in a tubal clot as shown in the case of number 977 represented in Figure 10 cannot be accepted as positive proof that all the rest of the conceptus was absorbed intratubally. A portion may have been aborted, yet specimens such as number 2035 and 1938 speak eloquently for the *possibility* of absorption. The embryo and yolk sac in the latter specimen are disintegrated almost completely and the scarcely recognizable remnants lie isolated in the chorionic cavity which is moderately filled with an amorphous coagulum. The stroma of the chorionic membrane is oedematous and degenerate but nevertheless contains some well-preserved vessels, a few of which contain some blood cells. The same thing is true of the stroma and of the vessels of the villi which also are in process of dissolution. A moderate amount of trophoblast is present but there is very little syncytium. The epithelium of some of the villi has undergone hyaline degeneration. The blood cells in the large clot in which this chorionic vesicle, which measured 8 x 5 mm. in section, was imbedded, are preserved fairly well, especially near the vesicle. Nevertheless, the old conceptus very apparently is in a state of disintegration and lysis, the tube wall is very thin and the mucosa congested, hemorrhagic and atrophic.

Number 2035, also a tubal specimen, likewise is an empty chorionic vesicle in process of disintegration, and many other specimens might be listed, but these examples suffice to indicate that intratubal, as well as intrauterine lysis and in part at least of absorption, of conceptuses undoubtedly occurs in the human being. It is of course exceedingly unlikely that in case of the

uterus this can occur before the impregnated ovum is imbedded, for failing to imbed it undoubtedly would escape relatively promptly although the observations of Kirkham, '16, show that the fertilized ova in mice suckling their young, may lie unimplanted within the uterus for over a week.

A free fertilized or unfertilized ovum which disintegrated within the tube on the other hand, might be absorbed completely. The same thing holds for early conceptuses within the

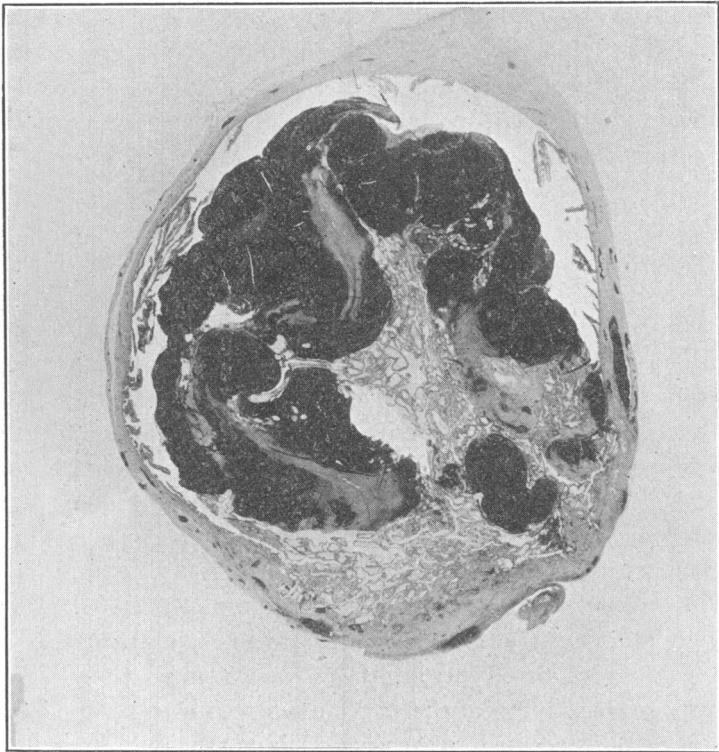


FIG. 10. Cross section of a tube with the contained blood clot and scattered chorionic villi, No. 977. $\times 4.4$.

implantation cavity, for a relatively small amount of hemorrhage could detach them completely without rupturing the capsularis. Death, disintegration, and absorption, as illustrated in the cases above, then might occur. In case of older specimens the hemor-

rhage responsible for the loosening of the conceptus would have to be proportionately much greater for the attachment of the placenta is firmer though rupture of the capsularis easier. That this assumption is correct is shown also by the almost universal history of bleeding in these cases and it is only in the early stages of development that the conceptus can be expelled entire while still contained in the implantation cavity, and aborted completely wrapped in the decidua as in case of number 698.

Since 12.8 per cent. of all abortions and 32.3 per cent. of all those classed as pathologic in the first one thousand accessions in the Mall Collection are composed of villi only, of empty chorionic vesicles, and essentially of chorion and amnion, one might assume that all these specimens represent stages in the process of intrauterine disintegration and absorption. Most of them undoubtedly do belong in this category but in many cases in which villi only are found the rest of the conceptus and in others the embryo as well, has been lost. Since 46.4 per cent. of all tubal specimens and 71. per cent. of all those classed as pathologic are composed of villi only, of empty chorionic vesicles and of chorion and amnion only, it might be assumed that digestion and absorption are more active within the tube than the uterus. Such a conclusion is not justified however, for almost all tubal specimens are isolated while young and only exceptionally does one reach the later months of pregnancy. Hence those falling in the above-named three groups of tubal specimens form a relatively larger percentage.

Cases of partial dissolution of the embryo are of course common, as almost every one knows. As far as I can learn however, the two cases reported here are the only ones offering unequivocal proof that dissolution of the entire conceptus may be absolutely complete and that the intact empty decidua then may be aborted. Such an event could for various reasons probably occur only in the early stages of pregnancy and must undoubtedly be relatively rare. Nevertheless, I am convinced that careful examination of all material aborted will multiply the evidence. From these things it also would seem possible that rarely pregnancy may supervene and be terminated without having attracted any attention whatsoever.

The phenomenon of intrauterine lysis is interesting also from a chemical standpoint. What the anatomist would like to know is not merely in what respects the composition of the intra- and peri-amniotic fluids has been changed, but just what the enzymes are that have caused a complete lysis of the embryo; where these first arise and act; and how and why they become active. These, and many other questions the chemist only can answer. For this answer fresh material is indispensable, but this the neighboring practitioners or a closely associated clinic can supply. That the lysis of these early embryos and undoubtedly also of the chorionic vesicles is not due primarily or even very materially to phagocytic activity is very evident even upon cursory examination. In the presence of the intact chorionic and amniotic vesicles in some specimens, such a process is wholly excluded. Besides, one never sees any evidence of phagocytosis of the preserved fetal by the maternal tissue in human conceptuses. Evidences of the contrary process are not wanting.

That the embryo or fetus usually is the first member of the conceptus to disappear has already been implied by stating that in 32 per cent. of the abortuses grouped as pathological in the Mall Collection, the embryo is missing. Although the absence of the embryo does not necessarily mean, in every case, that it underwent complete autolysis, this no doubt is true in by far the great majority of these cases. The fact that the embryo disappears first may be due to a lower resistance on its part than that possessed by either amnion or chorion, or to a preponderance of enzymes within it. Autolysis of the body of the embryo before that of the membranes, also may be due to the fact that the adnexa, especially the chorion, or at least parts of it, often preserve vitality long after the death of the embryo because of the direct relation to the uterus. Nevertheless, it often is surprising how long the form of a small retained fetus or even of the amnion apparently has been preserved, although it should be remembered that in some cases the preservation of external form gives little indication of the true state of the constituent tissues. If the advent of proteolytic fat-, and carbohydrate-splitting enzymes in fetal tissues is gradual, the surprisingly long time during which some of the small embryos are preserved may be due in a con-

siderable degree to this fact. Jones and Austrian, '07, found, for example, that the livers of young pig embryos contain no nulein enzymes, but that these increase as fetal development proceeds. The latter finding seems to be confirmed also by data given by Mendel and Leavenworth, '08, although these investigators found enzymes present at all ages. Schlesinger, '03, who was, I believe, the first to establish the occurrence of autolysis in retained human fetuses, also found that it varied with age and other conditions.

Since the chorionic villi do not undergo autolysis first, the conclusion that heterolysis is not an important factor in lysis of the conceptus, also seems justified. If enzymes of decidual origin played any large part in the process of lysis of the conceptus, one might, I presume, expect to find instances in which at least portions of the chorionic vesicle underwent lysis although the embryo itself remained quite unaffected. This, however, never seems to be the case and the same thing holds for the placenta and the chorionic vesicle and also for the decidua. That heterolysis probably plays only a very subsidiary rôle is indicated also by the fact that autolysis takes place in tubal implantations as well, and still more convincingly by its occurrence in ovarian implantations, as illustrated especially by the case of Holland, '11, and by other cases referred to by Meyer, and Wynne '19, in which the escape of portions of the conceptus from the ovarian implantation cavity could be wholly excluded. One reason for prolonged preservation of the decidua no doubt lies in the fact that it as a whole or at least in large part retains vitality because it remains quite undisturbed in its vascular relations.

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